# BOW LAKE

## 2017 SAMPLING HIGHLIGHTS

## Station 1 Ledges

### Barrington and Northwood, NH

Water quality data displayed in Tables 1 and 2 are surface water measurements with the exception of the dissolved oxygen data that were collected near the lake bottom. Refer to the 2017 Bow Lake Annual Report for additional information.

**Blue** = Excellent = Oligotrophic

**Yellow** = Fair = Mesotrophic

**Red** = Poor = Eutrophic

**Gray** = No Data

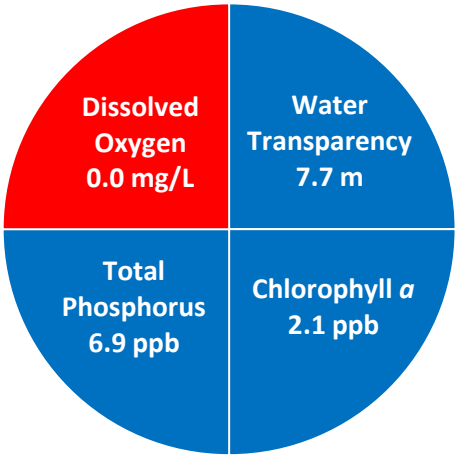



**Figure 1. Bow Lake Water Quality (2017)**

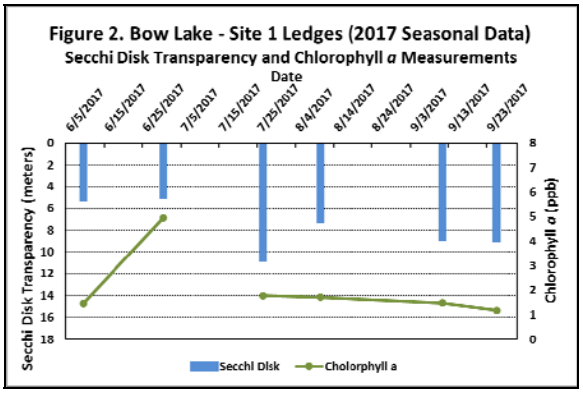
**Table 1. 2017 Bow Lake Seasonal Averages and NH DES Aquatic Life Nutrient Criteria[1]**

| Parameter | Oligotrophic "Excellent" | Mesotrophic "Fair" | Eutrophic "Poor" | Bow Lake – 1 Ledges Average (range) | Bow Lake – 1 Ledges Classification |
|---|---|---|---|---|---|
| Water Clarity (meters) | 4.0 – 7.0 | 2.5 - 4.0 | < 2.5 | **7.7** meters (5.0 – 10.8) | Oligotrophic |
| Chlorophyll *a* [1] (ppb) | < 3.3 | > 3.3 – 5.0 | > 5.0 – 11.0 | **2.1** ppb (1.2 – 5.0) | Oligotrophic |
| Total Phosphorus [1] (ppb) | < 8.0 | > 8.0 – 12.0 | > 12.0 – 28.0 | **6.9** ppb (4.9 – 10.1) | Oligotrophic |
| Dissolved Oxygen (mg/L) | 5.0 – 7.0 | 2.0 – 5.0 | <2.0 | **0.0** mg/L (0.0 – 0.3)* | Eutrophic |

* Dissolved oxygen concentrations were measured on September 11, 2017 between 11.0 and 20.5 meters, in the bottom water layer.

**Table 2. 2017 Bow Lake Seasonal Average Accessory Water Quality Measurements**

| Parameter | Assessment Criteria | | | | | Bow Lake – 1 Ledges Average (range) | Bow Lake – 1 Ledges Classification |
|---|---|---|---|---|---|---|---|
| Color (color units) | < 10 uncolored | 10 – 20 slightly colored | 20 – 40 lightly tea colored | 40 – 80 tea colored | > 80 highly colored | **18.8** color units (range: 13.2 – 23.7) | Slightly colored |
| Alkalinity (mg/L) | < 0.0 acidified | 0.1 – 2.0 extremely vulnerable | 2.1 – 10 moderately vulnerable | 10.1 – 25.0 low vulnerability | > 25.0 not vulnerable | **3.9** mg/L (range: 3.8 – 4.4) | Moderately vulnerable |
| pH (std units) | < 5.5 suboptimal for successful growth and reproduction | | 6.5 – 9.0 optimal range for fish growth and reproduction | | | **6.8** standard units (single value) | Optimal range for fish growth and reproduction |
| Specific Conductivity (*u*S/cm) | < 50 *u*S/cm Characteristic of minimally impacted NH lakes | | 50-100 *u*S/cm Lakes with some human influence | > 100 *u*S/cm Characteristic of lakes experiencing human disturbances | | **60.7** *u*S/cm (range: 60.7 – 60.9) | Lakes with some human influences |



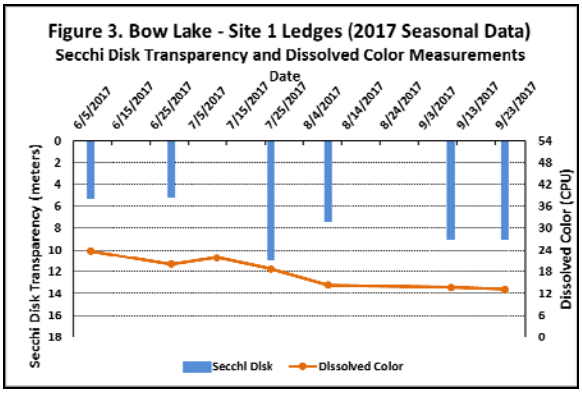




Figure 2 and 3. Seasonal Secchi disk transparency, chlorophyll *a* changes and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll *a* and/or color concentrations.

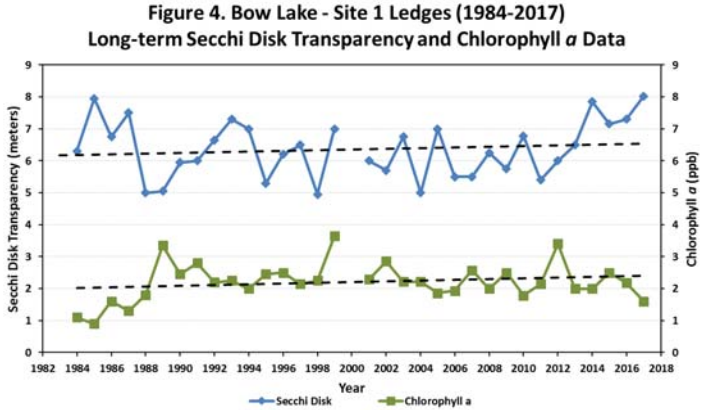
## LONG-TERM TRENDS

**WATER CLARITY:** The Bow Lake water clarity measurements, measured as Secchi Disk transparency, have oscillated among years but do not display a trend of increasing or decreasing water clarity over the thirty-three years of water quality monitoring conducted between 1984 and 2017 (Figure 4).

**CHLOROPHYLL:** The Bow Lake chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, display a trend of increasing concentrations over thirty-three years of water quality monitoring conducted between 1984 and 2017 (Figure 4).

**TOTAL PHOSPHORUS:** Phosphorus is the nutrient most responsible for microscopic plant growth. The Bow Lake total phosphorus concentrations display a trend of decreasing concentrations over twenty-eight years of water quality monitoring conducted between 1984 and 2017 (Figure 5).

**COLOR:** The Bow Lake color data, the result of naturally occurring "tea" color substances from the breakdown of soils and plant materials, display a trend of increasing concentrations over twenty-nine years of water quality monitoring conducted between 1984 and 2017 (Figure 5).



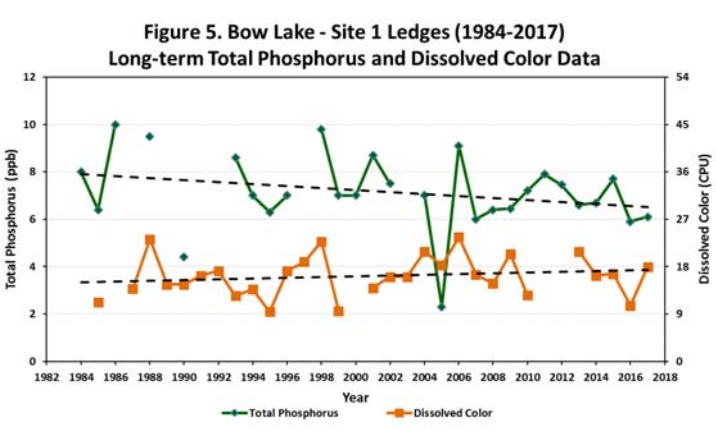




**Table 3. Bow Lake Seasonal Average Water Quality Inter-site Comparison (2017)**

| Site | Average Secchi Disk Transparency (meters) | Average Chlorophyll *a* (ppb) | Average Total Phosphorus (ppb) | Average Dissolved Oxygen (ppm) |
|---|---|---|---|---|
| 1 Ledges | 7.7 (range: 5.0-10.8) | 2.1 (range: 1.2-5.0) | 6.9 (range: 4.9-10.1) | 0.0 (range: 0.0 – 0.3) |
| 3 Bennett | 8.0 (range: 5.2-9.5) | 2.2 (range: 1.3-4.0) | 6.6 (range: 4.0-9.9) | 0.0 (range: 0.0 – 0.1) |

- Dissolved oxygen data were measured on September 11, 2017 in the bottom water layer (hypolimnion).

Figures 4 and 5. Changes in the Bow Lake water clarity (Secchi Disk depth), chlorophyll *a*, dissolved color and total phosphorus concentrations measured between 1984 and 2017. **These data illustrate the relationship among plant growth, water color and water clarity. Total phosphorus data are also displayed and are oftentimes correlated with the amount of plant growth.**

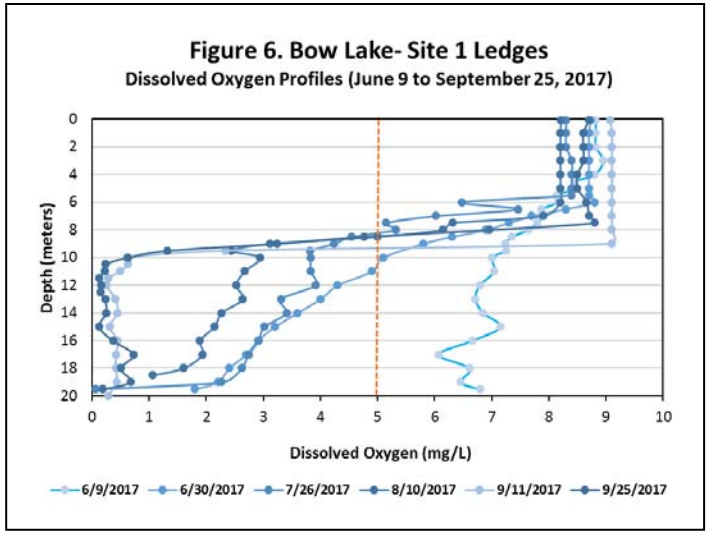



Figure 6. Bow Lake dissolved oxygen concentrations collected between June 9 and September 25, 2017. The vertical red line indicates the oxygen concentration commonly considered the threshold for successful growth and reproduction of cold water fish. *Notice the decreasing dissolved oxygen concentrations near the lake bottom between June and September.*

## Recommendations

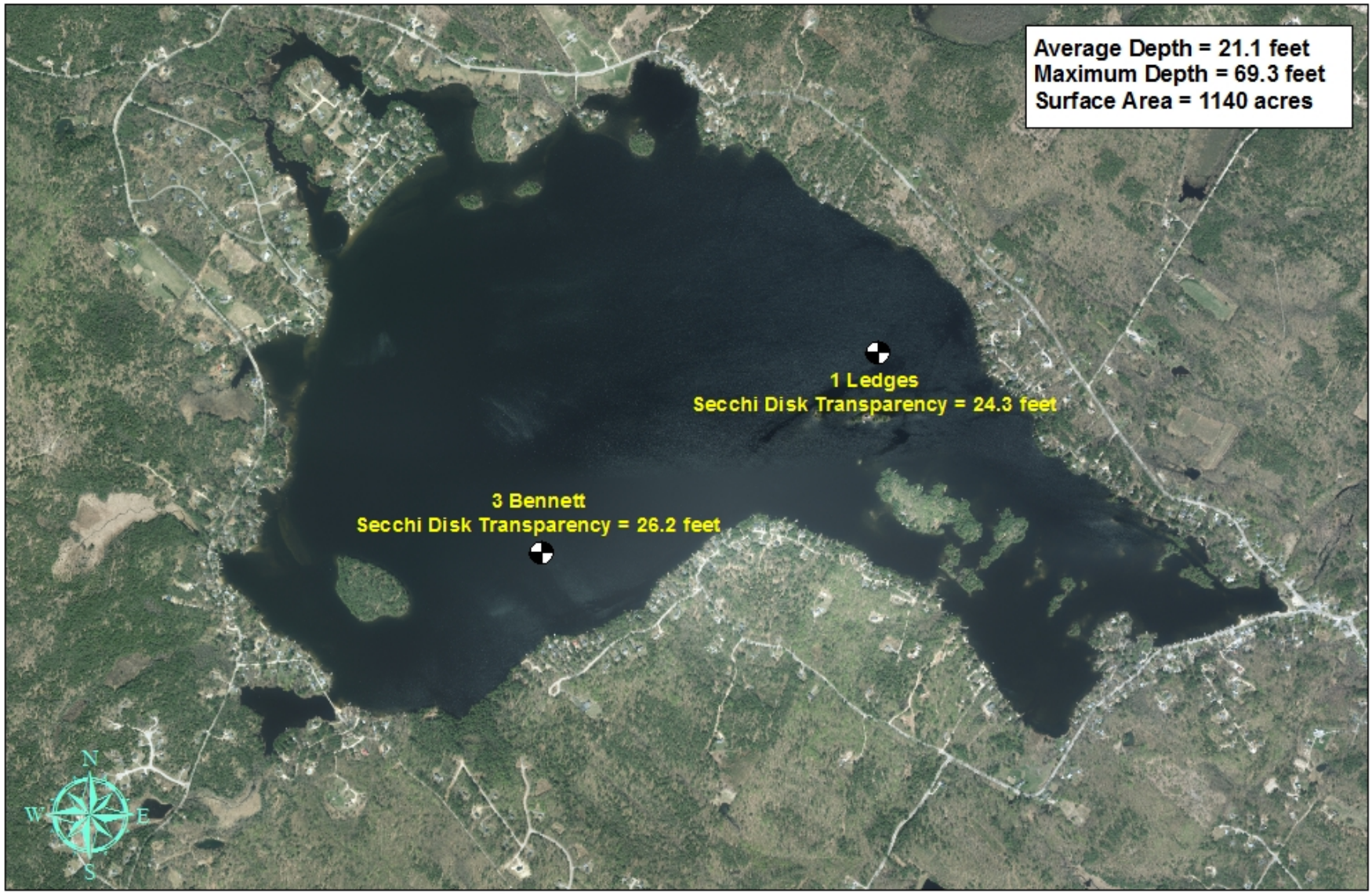
Implement Best Management Practices within the Bow Lake watershed to minimize the adverse impacts of polluted runoff and erosion into Bow Lake. Refer to "Landscaping at the Water's Edge: An Ecological Approach" and "New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home" for more information on how to reduce nutrient loading caused by overland run-off.

- http://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf
- http://soaknh.org/wp-content/uploads/2016/04/NH-Homeowner-Guide-2016.pdf

# Figure 7. Bow Lake

## Strafford & Northwood, NH

## 2017 Deep water sampling locations and the seasonal average water clarity




Aerial Orthophoto Source: NH GRANIT
Site location GPS coordinates collected by the UNH Center for Freshwater Biology

University of New Hampshire Cooperative Extension